Notes and Sources

Text Notes

Legislation and Regulations

[*1*] Federal Energy Regulatory Commission, *Regional Transmission Organizations*, 18 CFR Part 35 (Washington, DC, December 20, 1999).

[*2*] Federal Energy Regulatory Commission, "Commission Proposes New Foundation for Bulk Power Markets With Clear, Standardized Rule and Vigilant Oversight," Press Release (Washington, DC, July 31, 2002).

[*3*] "70 State Regulators Endorse US FERC Market Proposal," *Platts Global Energy* (August 16, 2002).

[*4*] Farm Security and Rural Investment Act of 2002, P.L. 107-171, Section 6013.

[*5*] Farm Security and Rural Investment Act of 2002, P.L. 107-171, Sections 7134 and 7223.

[*6*] Farm Security and Rural Investment Act of 2002, P.L. 107-171, Sections 8002 and 8102.

[*7*] Farm Security and Rural Investment Act of 2002, P.L. 107-171, Sections 9003-9009.

[*8*] U.S. Department of Agriculture, Farm Services Agency, web site www.fsa.usda.gov/daco/bio_daco.htm.

[*9*] U.S. Environmental Protection Agency, "Control of Emissions of Air Pollution from Non-road Diesel Engines: Final Rule," *Federal Register*, 40 CFR Parts 9, 86, and 89 (October 23, 1998).

[*10*] U.S. Environmental Protection Agency, "Control of Emissions of Air Pollution from New Marine Compression-Ignition Engines at or Above 37 kW: Final Rule," *Federal Register*, 40 CFR Parts 89, 92, and 94 (December 29, 1999).

[*11*] U.S. Environmental Protection Agency, "Emission Standards for Locomotives and Locomotive Engines: Final Rule," *Federal Register*, 40 CFR Parts 85, 86, and 92 (April 16, 1998).

[*12*] U.S. Environmental Protection Agency, *Emission Standards for New Non-road Engines*, EPA 420-F-02-03 (Washington, DC, September 2002).

Issues in Focus

[*13*] Letter from Senator Frank Murkowski (R-AK), Ranking Member, to Mary J. Hutzler, Acting Administrator, December 20, 2001.

[*14*] The analysis reports can be found on the EIA web site at www.eia.doe.gov/ bookshelf/services.html.

[*15*] Energy Information Administration, *Reducing Emissions of Sulfur Dioxide, Nitrogen Oxides, and Mercury from Electric Power Plants*, SR/OIAF/2001-04 (Washington, DC, October 2001).

[*16*] Combined heat and power (CHP) plants produce both electricity and useful thermal output. EIA formerly referred to these plants as cogenerators, but has determined that CHP better describes the facilities because some of the plants included in EIA's data do not produce heat and power in a sequential fashion, and as a result do not meet the legal definition of cogeneration specified in the Public Utilities Regulatory Policy Act (PURPA).

[*17*] There is a small impact from improved estimates of the quantity of natural gas consumed by independent power producers. For additional information, see Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002), Appendix H, "Estimating and Presenting Power Sector Fuel Use in EIA Publications and Analyses," web site www.eia.doe.gov/emeu/aer/pdf/pages/sec_h.pdf.

[*18*] A developmental well is a well drilled within the proved area of an oil or gas reservoir to the depth of a stratigraphic horizon known to be productive. An exploratory well is a well drilled to find and produce oil or gas in an unproved area, to find a new reservoir in a field previously found to be productive of oil or gas in another reservoir, or to extend the limit of a known oil or gas reservoir.

[*19*] Natural gas reserves that have been located but are isolated from potential markets are commonly referred to as "stranded gas." Such reserves are likely to provide most of the natural gas for LNG in the future. Reserves that can be linked to sources of demand via pipeline are unlikely candidates to be developed for LNG.

[*20*] Flared natural gas is natural gas burned in flares at the well site or at gas processing plants. It is often associated with oil production that is considered to be unmarketable.

[*21*] "Alaska Producer Pipeline Update," PowerPoint presentation by BP/ExxonMobil/Phillips (May 2002).

[*22*] Canadian National Energy Board, *Canadian Energy: Supply and Demand to 2025* (1999).

[*23*] Based on an estimate of 5.3 billion cubic feet per day capacity after expansion from 4.3 billion cubic feet per day.

[*24*] Heavy oil sands, also referred to as tar sands, are naturally occurring bitumen-impregnated sands that yield liquid hydrocarbons that require further processing beyond mechanical blending before becoming finished petroleum products. One thousand cubic feet of natural gas is required to produce 1.2 barrels of bitumen. According to an October 19, 2001, article in *First Facts*, "Where Will Gas from the Mackenzie Delta Go? Bitumen Development!," published by the First Energy Capital Corporation of Calgary, Alberta, almost 1,500 thousand cubic feet per day of natural gas could be needed to support bitumen production by 2010.

[*25*] Energy Information Administration, *International Energy Outlook 2002*, DOE/EIA-0484(2002) (Washington, DC, March 2002). International reserves definitions do not necessarily correspond to the categorizations of U.S. proved reserves and may include estimates of resources as well as proved reserves.

[*26*] Zeus Development Corporation, *2001 World LNG/GTL Review* (Houston, TX, 2001), p iii.

[*27*] El Paso's EP Energy Bridge™ is a ship-based LNG regasification system that uses proven offshore buoy technology to moor the ship and proprietary technology to regasify LNG onboard the ship and discharge it through a subsea pipeline. El Paso has three ships on order and expects the first to be in service by 2005.

[*28*] Capacity estimates are based in part on estimates for terminals that have been proposed in the different regions. New LNG facilities represent generic facilities in each of the coastal regions and may represent more than one facility.

[*29*] Five-year moving average growth rates are used to smooth the effects of annual variations caused by short-term shifts in weather or economic growth. The growth rates shown in Figure 25 are calculated as [(current year sales / current year-5 sales)$^{1/5}$ – 1] x 100.

[*30*] "President Announces Clear Skies & Global Climate Change Initiatives" web site www.whitehouse.gov/ news/releases/2002/02/ 20020214-5.html (February 14, 2002).

[*31*] U.S. Department of State, *U.S. Climate Action Report 2002* (Washington, DC, May 2002), Chapter 5, "Projected Greenhouse Gas Emissions," pp. 70-80, web site http:// yosemite.epa.gov/ oar/ globalwarming. nsf/ content/ ResourceCenterPublicationsUSClimate ActionReport.html.

Market Trends

[*32*] I. Ismail, "Future Growth in OPEC Oil Production Capacity and the Impact of Environmental Measures," presented to the Sixth Meeting of the International Energy Workshop (Vienna, Austria, June 1993).

[*33*] The transportation sector has been left out of these calculations because levels of transportation sector electricity use have historically been far less than 1 percent of delivered electricity. In the transportation sector, the difference between total and delivered energy consumption is also less than 1 percent.

[*34*] The high and low macroeconomic growth cases are linked to higher and lower population growth, respectively, which affects energy use in all sectors.

[*35*] The definition of the commercial sector for *AEO2003* is based on data from the 1999 Commercial Buildings Energy Consumption Survey (CBECS). See Energy Information Administration, 1999 CBECS Public Use Data Files (August 2002), web site www.eia.doe.gov/ emeu/cbecs/. Nonsampling and sampling errors (found in any statistical sample survey) resulted in a higher commercial floorspace estimate than found with the 1995 CBECS. In addition, 1999 CBECS energy intensities varied from earlier estimates, providing a different composition of end-use consumption. These factors contribute to the pattern of commercial energy use projected for *AEO2003*. Further discussion is provided in Appendix G.

[*36*] The intensities shown were disaggregated using the divisia index. The divisia index is a weighted sum of growth rates and is separated into a sectoral shift or "output" effect and an energy efficiency or "substitution" effect. It has at least two properties that make it superior to other indexes. First, it is not sensitive to where in the time period or in which direction the index is computed. Second, when the effects are separated, the individual components have the same magnitude, regardless of which is calculated first. See Energy Information Administration, "Structural Shift and Aggregate Energy Efficiency in Manufacturing" (unpublished working paper in support of the National Energy Strategy, May 1990); and Boyd et al., "Separating the Changing Effects of U.S. Manufacturing Production from Energy Efficiency Improvements," *Energy Journal*, Vol. 8, No. 2 (1987).

[*37*] Estimated as consumption of alternative transportation fuels in crude oil Btu equivalence.

[*38*] Small light trucks (compact pickup trucks and compact vans) are used primarily as passenger vehicles, whereas medium light trucks (compact utility trucks and standard vans) and large light trucks (standard utility trucks and standard pickup trucks) are used more heavily for commercial purposes.

[*39*] U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, *Scenarios of U.S. Carbon Reductions: Potential Impacts of Energy Technologies by 2010 and Beyond*, ORNL/CON-444 (Washington, DC, September 1997); J. DeCiro et al, *Technical Options for Improving the Fuel Economy of U.S. Cars and Light Trucks by 2010-2015* (Washington, DC: American Council for an Energy Efficient Economy, April 2001); M.A. Weiss et al, *On the Road in 2020 A Life-Cycle Analysis of New Automotive Technologies* (Cambridge, MA: Massachusetts Institute of Technology, October 2000); and A. Vyas, C. Saricks, and F. Stodolsky, *Projected Effect of Future Energy Efficiency and Emissions Improving Technologies on Fuel Consumption of Heavy Trucks* (Argonne, IL: Argonne National Laboratory, 2001).

[*40*] Values for incremental investments and energy expenditure savings are discounted back to 2003 at a 7-percent real discount rate.

[*41*] Unless otherwise noted, the term "capacity" in the discussion of electricity generation indicates utility, nonutility, and combined heat and power capacity.

[*42*] Includes the cost to connect to the transmission grid but does not include the cost of any required backup capacity for wind-powered generators. Partial or full backup generation capability may be required to allow wind power to provide reliable capacity equivalent to the other generation types shown.

[*43*] *AEO2003* does not include off-grid photovoltaics (PV). EIA estimates that as much as 91 megawatts of remote electricity generation PV applications (i.e., off-grid power systems) were in service in 2000, plus an additional 256 megawatts in communications, transportation, and assorted other non-grid-connected, specialized applications. See *Annual Energy Review 2001*, Table 10.6 (annual PV shipments, 1989-2000). The approach used to develop the estimate, based on shipment data, provides an upper estimate of the size of the PV stock, including both grid-based and off-grid PV. It will overestimate the size of the stock, because shipments include a substantial number of units that are exported, and each year some of the PV units installed earlier will be retired from service or abandoned.

[*44*] Hydroelectric and landfill gas assumptions are unchanged from the reference case. Assumptions are obtained or derived from the Electric Power Research Institute and DOE, Office of Energy Efficiency and Renewable Energy, *Renewable Energy Technology Characterizations*, EPRI-TR-109496 (Washington, DC, December 1997), web site www.eren.doe.gov/ power/techchar.html.

[*45*] The EPRI *Renewable Energy Technology Characterizations* represent projections as of 1997. Where the EPRI projected cost or performance values for 2002 do not match EIA estimates for 2002, the EIA estimate is used, and the EPRI rate of cost decline though 2025 is used to establish the 2025 target value.

[46] Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384 (2001) (Washington, DC, November 2002).

[47] Total labor costs are estimated by multiplying the average hourly earnings of coal mine production workers by total annual labor hours worked. Average hourly earnings do not represent total labor costs per hour for the employer, because they exclude retroactive payments and irregular bonuses, employee benefits, and the employer's share of payroll taxes.

[48] Variations in mining costs are not necessarily limited to changes in labor productivity and wage rates. Other factors that affect mining costs and, subsequently, the price of coal include such items as severance taxes, royalties, fuel costs, and the costs of parts and supplies.

[49] Energy Information Administration, *Energy Policy Act Transportation Rate Study: Final Report on Coal Transportation*, DOE/EIA-0597(2000) (Washington, DC, October 2000).

[50] Energy Information Administration, *Energy Policy Act Transportation Rate Study: Final Report on Coal Transportation*, DOE/EIA-0597(2000) (Washington, DC, October 2000). Tons refers to short tons.

[51] U.S. Environmental Protection Agency, web site http://www.epa.gov/airmarkets/arp/overview.html (October 25, 2002).

[52] Buildings: Energy Information Administration (EIA), *Technology Forecast Updates—Residential and Commercial Building Technologies—Advanced Adoption Case* (Arthur D. Little, Inc., October 2001). Industrial: EIA, *Industrial Model: Update on Energy Use and Industrial Characteristics* (Arthur D. Little, Inc., September 2001). Transportation: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, *Scenarios of U.S. Carbon Reductions: Potential Impacts of Energy Technologies by 2010 and Beyond,* ORNL/CON-444 (Washington, DC, September 1997); J. DeCicco and M. Ross, *An Updated Assessment of the Near-Term Potential for Improving Automotive Fuel Economy* (Washington, DC: American Council for an Energy-Efficient Economy, November 1993); and A. Vyas, C. Saricks, and F. Stodolsky, *Projected Effect of Future Energy Efficiency and Emissions Improving Technologies on Fuel Consumption of Heavy Trucks* (Argonne, IL: Argonne National Laboratory, 2001). Fossil-fired generating technologies: U.S. Department of Energy, Office of Fossil Energy. Renewable Generating Technologies: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, and Electric Power Research Institute, *Renewable Energy Technology Characterizations*, EPRI-TR-109496 (Washington, DC, December 1997).

Table Notes and Sources

Note: Tables indicated as sources in these notes refer to the tables in Appendixes A, B, and C of this report.

Table 1. Summary of results: Tables A1, A19, A20, B1, B19, B20, C1, C19, and C20.

Table 2. Proposed LNG import terminals to serve U.S. markets as of August 2002: Energy Information Administration, Office of Oil and Gas. **Note:** Design capacity for the EP Energy Bridge™ terminal is based on three ships with a design capacity of 400 million cubic feet per day each, (as indicated in a May 8, 2002, press release from El Paso Global LNG, a subsidiary of El Paso Corporation).

Table 3. LNG facility trigger prices by facility and region: Energy Information Administration, Office of integrated Analysis and Forecasting. **Note:** The individual trigger price represents the lowest feasible combination of production, liquefaction, and transportation costs to the facility plus the regasification cost at the facility (see Table 4). Regasification costs at new facilities include capital costs for their construction.

Table 4. Components of LNG trigger prices for new facilities: Stranded natural gas production costs represent expert judgments based on sources that include Zeus Development Corporation, *2001 World LNG/GTL Review* (Houston, TX, 2001), and "Asian Gas Prospects-1," *Oil & Gas Journal* (March 5, 2001). Liquefaction costs for different supply sources are based on an average liquefaction capital cost of $1 billion for one train (3 million metric tons of LNG or 143 billion cubic feet per year) amortized over a 20-year period with a 12-percent discount rate and a 3-year construction period, adjusted to account for individual plant factors such as age and location. LNG per-mile transportation costs are based on the distance-weighted average of per-mile shipment costs from Australia to Japan and from Indonesia to Japan. The shipment costs are drawn from "Asian Gas Prospects-1," *Oil & Gas Journal* (March 5, 2001). The per-unit average cost is applied to the distances from supply sources to different LNG receiving terminals in the United States to arrive at initial transportation costs. Final transportation costs are computed taking into account the return on capital (12-percent rate of return) based on a $165 million capital cost per ship, depreciation over a 20-year period, and an assumed tanker capacity of 3 billion cubic feet per trip. Regasification costs were arrived at using expert judgment based on capital and operating expenses developed by PTL Associates for a generic LNG import terminal with two storage tanks and a total capacity of 183 billion cubic feet per year, at a seismically inactive site with no requirement for dredging or piling. The costs were adjusted to account for land purchase, rate of return, site-specific permitting, special land and waterway preparation and/or acquisitions, and regulatory costs.

Table 5. *AEO2003* projections for lower 48 wellhead natural gas prices and consumption, Alaskan production, and Canadian, Mexican, and LNG imports in three cases: AEO2003 National Energy modeling System, runs LM2003.D110502C, AEO2003.D110502C, and HM2003.D110502C. **Notes:** Canadian imports include all gas imported from Canada, including western Canadian, eastern Canadian, and the MacKenzie Delta. Alaskan production includes gas produced for consumption in Alaska plus 65 billion cubic feet per year of LNG exported to Japan. LNG imports do not include LNG from Baja California, Mexico, which is included in net imports from Mexico.

Table 6. Projected changes in U.S. greenhouse gas emissions, gross domestic product, and greenhouse gas intensity, 2002-2012: Carbon dioxide emissions and gross domestic product: AEO2003 National Energy modeling System, run AEO2003.D110502C. **Other gases and adjustments:** U.S. Department of State, *U.S. Climate Action Report 2002* (Washington, DC, May 2002), pp. 70-80 (2002 and 2012 values calculated by interpolation). **Note:**

Greenhouse gas emissions totals exclude carbon sequestration, for consistency with Administration figures.

Table 7. New car and light truck horsepower ratings and market shares, 1990-2025: History: U.S. Department of Transportation, National Highway Traffic Safety Administration. **Projections:** AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Table 8. Costs of producing electricity from new plants, 2010 and 2025: AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Table 9. Technically recoverable U.S. natural gas resources as of January 1, 2002: Energy Information Administration, Office of Integrated Analysis and Forecasting.

Table 10. Onshore and offshore lower 48 crude oil production in three cases, 2025: AEO2003 National Energy Modeling System, runs AEO2003.D110502C, LW2002.D110502C, and HW2002.D110502C.

Table 11. Technically recoverable U.S. oil resources as of January 1, 2002: Energy Information Administration, Office of Integrated Analysis and Forecasting.

Table 12. Crude oil production from Gulf of Mexico offshore, 2001-2025: AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Table 13. Petroleum consumption and net imports in five cases, 2001 and 2025: 2001: Energy Information Administration, *Petroleum Supply Annual 2001*, Vol. 1, DOE/EIA-0340 (2001)/1 (Washington, DC, June 2001). **2025:** Tables A11, B11, and C11.

Table 14. Forecasts of annual average economic growth, 2001-2025: ***AEO2003*****:** Table B20. ***AEO2002:*** AEO2002 National Energy Modeling System, run AEO2003.D102001B. **GII (formerly DRI-WEFA):** Global Insight Macroeconomic Model AII250502 (May 2002). **OMB:** Office of Management and Budget (July 2002). **CBO:** Congressional Budget Office (August 2002). **OEF:** Oxford Economic Forecasting, *World Long-Term Economic Prospects* (August 2002). **DBAB:** Deutsche Banc Alex.Brown, *Oil Market Outlook* (September 5, 2002).

Table 15. Forecasts of world oil prices, 2000-2025: ***AEO2003*****:** Tables A1 and C1. ***AEO2002:*** AEO2002 National Energy Modeling System, run AEO2003.D102001B. **GII (formerly DRI-WEFA):** Global Insight, *Oil Market Outlook: Long-Term Focus* (Spring-Summer 2002). Note: Prices shown here differ from those shown in Table 22. The source is a later edition of the *Long-Term Focus* that was developed in a nonintegrated run. **Altos:** Altos Partners, World Oil Model, e-mail from Tom Choi (October 9, 2002). Note: Price is WTI at Cushing. **IEA:** International Energy Agency, *World Energy Outlook 2002* (September 2002). Note: Price is crude oil import price. **PEL:** Petroleum Economics, Ltd., *World Long Term Oil and Energy Outlook* (June 2002). Note: Brent price. **PIRA:** PIRA Energy Group, *Retainer Client Seminar* (October 2002). Note: Price is WTI at Cushing. **NRCan:** Natural Resources Canada, *Canada's Energy Outlook 1996-2020* (April 1997 and reaffirmed in August 2002). **DBAB:** Deutsche Banc Alex.Brown, *World Oil Supply and Demand Estimates* (September 2002). **EEA:** Energy and Environmental Analysis, Inc., EEA Compass Service (October 2002). Note: Price is U.S. refiner's acquisition cost of crude oil.

Table 16. Forecasts of average annual growth rates for energy consumption: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). ***AEO2003*****:** Table A2. **GII (formerly DRI-WEFA):** Global Insight, *Winter 2001-2002 U.S. Energy Outlook* (May 2002). Note: Delivered energy includes petroleum, natural gas, coal, and electricity (excluding generation and transmission losses) consumed in the residential, commercial, industrial, and transportation sectors.

Table 17. Forecasts of average annual growth in residential energy demand: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). ***AEO2003*****:** Table A2. **GII (formerly DRI-WEFA):** Global Insight, *Winter 2001-2002 U.S. Energy Outlook* (May 2002).

Table 18. Forecasts of average annual growth in commercial energy demand: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). ***AEO2003*****:** Table A2. **GII (formerly DRI-WEFA):** Global Insight, *Winter 2001-2002 U.S. Energy Outlook* (May 2002).

Table 19. Forecasts of average annual growth in industrial energy demand: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). ***AEO2003*****:** Table A2. **GII (formerly DRI-WEFA):** Global Insight, *Winter 2001-2002 U.S. Energy Outlook* (May 2002).

Table 20. Forecasts of average annual growth in transportation energy demand and key indicators: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002); Federal Highway Administration, *Highway Statistics 2000* (Washington, DC, 2002); Research and Special Programs Administration, "Fuel Cost and Consumption Tables," and National Highway Transportation Safety Administration, *Summary of Fuel Economy Performance* (Washington, DC, March 2001). ***AEO2003*****:** Tables A2, A3, and A7. **GII (formerly DRI-WEFA):** Global Insight, *Winter 2001-2002 U.S. Energy Outlook* (May 2002).

Table 21. Comparison of electricity forecasts: ***AEO2003*****:** AEO2003 National Energy Modeling System, runs AEO2003.D110502C, LM2002.D110502C, and HM2002.D110502C. **GII (formerly DRI-WEFA):** Global Insight, *Winter 2001-2002 U.S. Energy Outlook* (May 2002).

Table 22. Comparison of natural gas forecasts: ***AEO2003*****:** AEO2003 National Energy Modeling System, runs AEO2003.D110502C, LM2002.D110502C, and HM2002.D110502C. **GII (formerly DRI-WEFA):** Global Insight, *Winter 2001-2002 U.S. Energy Outlook* (May 2002).

Table 23. Comparison of petroleum forecasts: ***AEO2003*****:** AEO2003 National Energy Modeling System, runs AEO2003.D110502C, LW2002.D110502C, and HW2002.D110502C. **GII (formerly DRI-WEFA):** Global Insight, *Winter 2001-2002 U.S. Energy Outlook* (May 2002). **IPAA:** Independent Petroleum Association of America, *IPAA Supply and Demand Committee Long-Run Report* (April 2001).

Table 24. Comparison of coal forecasts: ***AEO2003*****:** AEO2003 National Energy Modeling System, runs AEO2003.D110502C, LM2003.D110502C, and HM2003.D110502C. **EVA:** Energy Ventures Analysis, Inc., "Energy Ventures Analysis Forecast—August 2002." **Hill & Associates:** Hill & Associates, Inc., *The Outlook for U.S. Steam Coal: Long-Term Forecast to 2021* (May 2002).

Figure Notes and Sources

Note: Tables indicated as sources in these notes refer to the tables in Appendixes A, B, C, and F of this report.

Figure 1. Energy price projections, 2001-2025: *AEO2002* and *AEO2003* compared: *AEO2002* projections: Energy Information Administration, *Annual Energy Outlook 2002*, DOE/EIA-0383(2002) (Washington, DC, December 2001). ***AEO2003* projections:** Table A1.

Figure 2. Energy consumption by fuel, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, August 2002). **Projections:** Tables A1 and A18.

Figure 3. Energy use per capita and per dollar of gross domestic product, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, August 2002). **Projections:** Table A20.

Figure 4. Electricity generation by fuel, 1970-2025: **History:** Energy Information Administration (EIA), Form EIA-860B, "Annual Electric Generator Report—Nonutility"; EIA, *Annual Energy Review 2001*, DOE/EIA-0384 (2001) (Washington, DC, November 2002); and Edison Electric Institute. **Projections:** Table A8.

Figure 5. Total energy production and consumption, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Table A1.

Figure 6. Energy production by fuel, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Tables A1 and A18.

Figure 7. Projected U.S. carbon dioxide emissions by sector and fuel, 1990-2025: History: Energy Information Administration, *Emissions of Greenhouse Gases in the United States 2001*, DOE/EIA-0573(2001) (Washington, DC, December 2002). **Projections:** Table A19.

Figure 8. Changes in *AEO* data for 1998-2000 natural gas consumption by sector: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384 (2001) (Washington, DC, November 2002), Appendix H, "Estimating and Presenting Power Sector Fuel Use in EIA Publications and Analyses," web site www.eia.doe.gov/emeu/aer/pdf/pages/sec_h.pdf.

Figure 9. Changes in *AEO* data for 1998-2000 renewable fuels consumption by sector: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002), Appendix H, "Estimating and Presenting Power Sector Fuel Use in EIA Publications and Analyses," web site www.eia.doe.gov/emeu/aer/pdf/pages/sec_h.pdf.

Figure 10. Technically recoverable U.S. natural gas resources as of January 1, 2002: Onshore, State Offshore, and Alaska: U.S. Geological Survey (USGS), with adjustments to unconventional gas recovery resources by Advanced Resources, International. **Federal (Outer Continental Shelf) Offshore:** Minerals Management Service (MMS), with subsalt resources from the National Petroleum Council. **Proved Reserves:** EIA, Office of Oil and Gas. **Note:** Data reflect removal of intervening reserve additions between the dates of the USGS estimate (January 1, 1994) and the MMS estimate (January 1, 1999) and January 1, 2002.

Figure 11. Lower 48 natural gas wells drilled, 1990-2025: 1990-1994: EIA computations based on well reports submitted to the American Petroleum Institute. **1995-2001:** EIA computations based on well reports submitted to Information Handling Services Energy Group, Inc. **Projections:** AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 12. Average onshore natural gas success rates, 1990-2025: 1990-1994: EIA computations based on well reports submitted to the American Petroleum Institute. **1995-2001:** EIA computations based on well reports submitted to Information Handling Services Energy Group, Inc. **Projections:** AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 13. Average natural gas drilling costs, 1990-2025: 1990-2000: American Petroleum Institute, Independent Petroleum Association of America, Mid-Continent Oil and Gas Association, *1990-2000 Joint Association Survey on Drilling Costs*. **Projections:** AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 14. Average reserve addition per nonassociated gas well, 1990-2025: 1990-1994: EIA computations based on well reports submitted to the American Petroleum Institute and reserve additions from EIA, Office of Oil and Gas, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, DOE/EIA-0216(90-94). **1995-2001:** EIA computations based on well reports submitted to Information Handling Services Energy Group, Inc., and reserve additions from EIA, Office of Oil and Gas, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, DOE/EIA-0216(95-2001). **Projections:** AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 15. Nonassociated natural gas reserve additions in known fields, 1990-2025: Onshore unconventional, 1990-2000: Advanced Resources International (ARI). **2001:** EIA, Office of Integrated Analysis and Forecasting. **Onshore conventional, 1990-2000:** EIA computation based on onshore unconventional reserve additions from ARI, and total onshore reserve additions from EIA, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, DOE/EIA-0216(90-2000). **2001:** EIA, Office of Integrated Analysis and Forecasting. **Offshore, 1990-2001:** EIA, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, DOE/EIA-0216(90-2001). **Projections:** AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 16. Nonassociated natural gas reserve additions from new field discoveries, 1990-2025: 1990-2001: EIA, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, DOE/EIA-0216(90-2001). **Projections:** AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 17. Lower 48 nonassociated production-to-reserves (PR) ratios, 1990-2025: Unconventional onshore, 1990-2001: EIA computation based on production and reserves from Advanced Resources International (ARI). **Conventional onshore, 1990-2001:** EIA computation based on onshore unconventional production and reserves from ARI; total onshore reserves from EIA, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, DOE/EIA-0216(90-2001); and total onshore production

from EIA, *Natural Gas Annual 1990-2001*, DOE/EIA-0131(90-01). **Offshore, 1990-2001:** EIA computation based on offshore reserves from EIA, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, DOE/EIA-0216(90-2001), and offshore production from EIA, *Natural Gas Annual*, DOE/EIA-0131(90-01). **Projections:** AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 18. Lower 48 dry natural gas production, 1990-2025: Unconventional onshore, 1990-2000: Advanced Resources International (ARI). **2001:** EIA, Office of Integrated Analysis and Forecasting. **Onshore conventional nonassociated, 1990-2000:** EIA computation based on onshore unconventional production from ARI, and total onshore nonassociated production from EIA, *Natural Gas Annual*, DOE/EIA-0131(90-00). **2001:** EIA, Office of Integrated Analysis and Forecasting. **Offshore nonassociated and associated-dissolved, 1990-2001:** EIA computation based on production from EIA, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, DOE/EIA-0216(90-2001), and *Natural Gas Annual*, DOE/EIA-0131(90-01). **Projections:** AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 19. Average lower 48 natural gas wellhead price, 1990-2025: 1990-2001: EIA, *Natural Gas Annual*, DOE/EIA-0131(90-01). **Projections:** AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 20. Major sources of incremental natural gas supply, 2002-2025: Source: AEO2003 National Energy modeling System, run AEO2003.D110502C. Note: "All other production" includes total associated-dissolved, nonassociated conventional, lower 48 offshore, and supplemental natural gas production and 2001 Canadian, Mexican, and LNG imports and Alaskan and nonassociated unconventional production.

Figure 21. Projected LNG imports by terminal and region in the reference case, 2025: AEO2003 National Energy modeling System, run AEO2003.D110502C.

Figure 22. Electricity sales, 1950-2005: History: Energy Information Administration, *Annual Energy Review 2000*, DOE/EIA-0384(2000) (Washington, DC, August 2001). **Projections:** Table A8.

Figure 23. Electricity generating capacity, 1950-2005: History: Energy Information Administration, Form EIA-860A, "Annual Electric Generator Report—Utility," and Form EIA-860B, "Annual Electric Generator Report—Nonutility." **Projections:** Table A9.

Figure 24. Electricity sales and generating capacity, 1950-2005: History: Energy Information *Administration, Annual Energy Review 2000*, DOE/EIA-0384(2000) (Washington, DC, August 2001), and Form EIA-860A, "Annual Electric Generator Report—Utility," and Form EIA-860B, "Annual Electric Generator Report—Nonutility." **Projections:** Tables A8 and A9.

Figure 25. Electricity sales growth, 1955-1999: History: Energy Information Administration, *Annual Energy Review 2000*, DOE/EIA-0384(2000) (Washington, DC, August 2001). **Projections:** Table A8.

Figure 26. Generating capacity added by year, 1900-2004: Energy Information Administration, Form EIA-860A, "Annual Electric Generator Report—Utility," and Form EIA-860B, "Annual Electric Generator Report—Nonutility."

Figure 27. Average U.S. summer capacity margin, 1986-2001: North American Electric Reliability Council, *Reliability Assessment, 2001-2010*, and predecessor documents. See web site ftp://www.nerc.com/pub/sys/all_updl/docs/pubs/2001ras.pdf.

Figure 28. Projected average annual real growth rates of economic factors, 2001-2025: History: U.S. Department of Commerce, Bureau of Economic Analysis. **Projections:** AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 29. Projected sectoral composition of GDP growth, 2001-2025: History: U.S. Department of Commerce and Global Insight (formerly DRI-WEFA) U.S. Industry Service. **Projections:** AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 30. Projected average annual real growth rates of economic factors in three cases, 2001-2025: History: U.S. Department of Commerce, Bureau of Economic Analysis. **Projections:** AEO2003 National Energy Modeling System, runs AEO2003.D110502C, HM2002.D110502C, and LM2002.D110502C.

Figure 31. Average annual GDP growth rate for the preceding 24 years, 1970-2025: History: U.S. Department of Commerce, Bureau of Economic Analysis. **Projections:** AEO2003 National Energy Modeling System, runs AEO2003.D110502C, HM2002.D110502C, and LM2002.D110502C.

Figure 32. World oil prices in three cases, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Tables A1 and C1.

Figure 33. OPEC oil production in three cases, 1970-2025: History: Energy Information Administration, *International Petroleum Monthly*, DOE/EIA-0520(2002/09) (Washington, DC, September 2002). **Projections:** Tables A21 and C21.

Figure 34. Non-OPEC oil production in three cases, 1970-2025: History: Energy Information Administration, *International Petroleum Monthly*, DOE/EIA-0520(2002/09) (Washington, DC, September 2002). **Projections:** Tables A21 and C21.

Figure 35. Persian Gulf share of worldwide crude oil exports in three cases, 1965-2025: History: Energy Information Administration, *International Petroleum Monthly*, DOE/EIA-0520(2002/09) (Washington, DC, September 2002). **Projections:** AEO2003 National Energy Modeling System, runs AEO2003.D110502C, HW2002.D110502C, and LW2002.D110502C.

Figure 36. Projected U.S. gross petroleum imports by source, 2001-2025: AEO2003 National Energy Modeling System, run AEO2003.D110502C; and World Oil, Refining, Logistics, and Demand (WORLD) Model, run AEO02B.

Figure 37. Projected worldwide refining capacity by region, 2001 and 2025: History: *Oil and Gas Journal*, Energy Database (January 2001). **Projections:** AEO2003 National Energy Modeling System, run AEO2003.D110502C; and World Oil, Refining, Logistics, and Demand (WORLD) Model, run AEO02B.

Figure 38. Primary and delivered energy consumption, excluding transportation use, 1970-2025: History: Energy Information Administration, *Annual Energy*

Review 2001, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Table A2.

Figure 39. Energy use per capita and per dollar of gross domestic product, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Table A2.

Figure 40. Delivered energy use by fossil fuel and primary energy use for electricity generation, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Table A2.

Figure 41. Primary energy consumption by sector, 1970-2025: History: Energy Information Administration, *State Energy Data Report 2000*, DOE/EIA-0214(2000) (Washington, DC, May 2002), and *Annual Energy Outlook 2001*, DOE/EIA-0384(2001) (Washington, D.C., November 2001). **Projections:** Table A2.

Figure 42. Residential primary energy consumption by fuel, 1970-2025: History: Energy Information Administration, *State Energy Data Report 2000*, DOE/EIA-0214 (2000) (Washington, DC, May 2002), and *Annual Energy Outlook 2001*, DOE/EIA-0384(2001) (Washington, D.C., November 2001). **Projections:** Table A2.

Figure 43. Residential primary energy consumption by end use, 1990, 1997, 2010, and 2025: History: Energy Information Administration, *Residential Energy Consumption Survey 1997*. **Projections:** Table A4.

Figure 44. Efficiency indicators for selected residential appliances, 2000 and 2025: Arthur D. Little, Inc., “EIA Technology Forecast Updates,” Reference No. 8675309 (October 2001), and AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 45. Commercial primary energy consumption by fuel, 1970-2025: History: Energy Information Administration, *State Energy Data Report 2000*, DOE/EIA-0214 (2000) (Washington, DC, May 2002), and *Annual Energy Outlook 2001*, DOE/EIA-0384(2001) (Washington, D.C., November 2001). **Projections:** Table A2.

Figure 46. Commercial primary energy consumption by end use, 2001 and 2025: Table A5.

Figure 47. Industrial primary energy consumption by fuel, 1970-2025: History: Energy Information Administration, *State Energy Data Report 2000*, DOE/EIA-0214 (2000) (Washington, DC, May 2002), and *Annual Energy Outlook 2001*, DOE/EIA-0384(2001) (Washington, D.C., November 2001). **Projections:** Table A2.

Figure 48. Industrial primary energy consumption by industry category, 1998-2025: AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 49. Industrial delivered energy intensity by component, 1998-2025: AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 50. Transportation energy consumption by fuel, 1975, 2001, and 2025: History: Energy Information Administration (EIA), *State Energy Data Report 2000*, DOE/EIA-0214(2000) (Washington, DC, May 2002), and EIA, *Short-Term Energy Outlook October 2002*. **Projections:** Table A2.

Figure 51. Projected transportation stock fuel efficiency by mode, 2001-2025: Table A7.

Figure 52. Projected technology penetration by mode of travel, 2025: AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 53. Projected sales of advanced technology light-duty vehicles by fuel type, 2010 and 2025: AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 54. Projected variation from reference case primary energy use by sector in two alternative cases, 2015, 2020, and 2025: Tables A2, F1, F2, and F3.

Figure 55. Projected variation from reference case primary residential energy use in three alternative cases, 2001-2025: Tables A2 and F1.

Figure 56. Buildings sector electricity generation from advanced technologies in alternative cases, 2010-2025 AEO2003 National Energy Modeling System, runs AEO2003.D110502C, BLDHIGH.D110602A, and BLDBEST.D110602A.

Figure 57. Projected variation from reference case primary commercial energy use in three alternative cases, 2001-2025: Tables A2 and F1.

Figure 58. Projected industrial primary energy intensity in two alternative cases, 1998-2025: Tables A2 and F2.

Figure 59. Projected changes in key components of the transportation sector in two alternative cases, 2025: Table A2 and AEO2003 National Energy Modeling System, runs AEO2003.D110502C, TRAN.D102401C, and HIGHTECH.D102401A.

Figure 60. Population, gross domestic product, and electricity sales, 1965-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Tables A8 and A20.

Figure 61. Annual electricity sales by sector, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Table A8.

Figure 62. Additions to electricity generating capacity, 1998-2002: Energy Information Administration, Form 890, “Annual Electric Generation Report” (2001 preliminary), and RDI, NEWGen database (July 2002 release).

Figure 63. Projected new generating capacity and retirements, 2001-2025: Table A9.

Figure 64. Projected electricity generation capacity additions by fuel type, including combined heat and power, 2001-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384 (2001) (Washington, DC, November 2002). **Projections:** Table A3.

Figure 65. Fuel prices to electricity generators, 1990-2025 2001: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Table A3.

Figure 66. Average U.S. retail electricity prices, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Table A8.

Figure 67. Projected levelized electricity generation costs, 2010 and 2025: AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 68. Projected electricity generation by fuel, 2001 and 2025: Table A8.

Figure 69. Nuclear power plant capacity factors, 1973-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 70. Projected levelized electricity costs by fuel type in the advanced nuclear cost case, 2010 and 2025: AEO2003 National Energy Modeling System, runs AEO2003.D110502C110502C and ADVNUC03. D110602A. **Note:** Includes generation and interconnection costs.

Figure 71. Projected cumulative new generating capacity by type in two cases, 2001-2025: Tables A9 and F6.

Figure 72. Projected cumulative new generating capacity by technology type in three economic growth cases, 2001-2025: Tables A9 and B9.

Figure 73. Projected cumulative new generating capacity by technology type in three fossil fuel technology cases, 2001-2025: Table F7.

Figure 74. Grid-connected electricity generation from renewable energy sources, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Table A17. Note: Data for nonutility producers are not available before 1989.

Figure 75. Projected nonhydroelectric renewable electricity generation by energy source, 2010, 2020, and 2025: Table A17.

Figure 76. Projected nonhydroelectric renewable electricity generation by energy source in two cases, 2025: Table F8.

Figure 77. Projected additions of renewable generating capacity, 2001-2025: AEO2003 National Energy Modeling System, run AEO2003.110502C.

Figure 78. Projected lower 48 natural gas wellhead prices in three cases, 2010 and 2025: 2001: Energy Information Administration, *Natural Gas Annual 2000*, DOE/EIA-0131(2000) (Washington, DC, October 2001). **2010 and 2025:** Tables A1 and B1.

Figure 79. Lower 48 natural gas reserve additions, 1970-2025: 1970-1976: Energy Information Administration (EIA), Office of Integrated Analysis and Forecasting, computations based on well reports submitted to the American Petroleum Institute. **1977-2000:** EIA, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, DOE/EIA-0216(77-2000). **2001 and projections:** AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 80. Natural gas production by source, 1990-2025: History: Total production and Alaska: Energy Information Administration (EIA), *Natural Gas Annual 2000*, DOE/EIA-0131(2000) (Washington, DC, October 2001). Offshore, associated-dissolved, and conventional: EIA, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, DOE/EIA-0216. Unconventional: EIA, Office of Integrated Analysis and Forecasting. **2001 and projections:** Table A15. Note: Unconventional gas recovery consists principally of production from reservoirs with low permeability (tight sands) but also includes methane from coal seams and gas from shales.

Figure 81. Net U.S. imports of natural gas, 1970-2025: History: Energy Information Administration (EIA), *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Table A13.

Figure 82. Natural gas consumption by sector, 1990-2025: History: Electric utilities: Energy Information Administration (EIA), *Electric Power Annual 2001*, Vol. 1, DOE/EIA-0348(2001)/1 (Washington, DC, August 2001). Nonutilities: EIA, Form EIA-860B, "Annual Electric Generator Report—Nonutility." Other: EIA, *State Energy Data Report 2000*, DOE/EIA-0214(2000) (Washington, DC, May 2002). **Projections:** Table A13.

Figure 83. Natural gas end-use prices by sector, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Table A14.

Figure 84. Projected changes in U.S. natural gas supply by region and source, 2001-2025: AEO2002 National Energy Modeling System, run AEO2002.D102001B.

Figure 85. Projected changes in end-use natural gas consumption by region, 2001-2025: AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 86. Projected lower 48 natural gas wellhead prices in three cases, 2010 and 2025: 2001: Energy Information Administration, *Natural Gas Annual 2000*, DOE/EIA-0131(2000) (Washington, DC, October 2001). **2010 and 2025:** Table F10.

Figure 87. Lower 48 natural gas production in three cases, 1970-2025: History: Energy Information Administration (EIA), *Natural Gas Annual 2000*, DOE/EIA-0131 (2000) (Washington, DC, October 2001). **2001 and Projections:** Table F10.

Figure 88. Lower 48 crude oil wellhead prices in three cases, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Tables A15 and C15.

Figure 89. U.S. petroleum consumption in five cases, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Tables A11, B11, and C11.

Figure 90. Lower 48 crude oil reserve additions in three cases, 1970-2025: 1970-1976: Energy Information Administration (EIA), Office of Integrated Analysis and Forecasting, computations based on well reports submitted to the American Petroleum Institute. **1977-2000:** EIA, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, DOE/EIA-0216(77-2000). **2001 and projections:** AEO2003 National Energy Modeling System, runs AEO2003.D110502C, LW2002.D110502C, and HW2002. D110502C.

Figure 91. Lower 48 crude oil production by source, 1970-2025: 1970-1976: 1970-1976: Energy Information Administration (EIA), Office of Integrated Analysis and Forecasting, computations based on well reports submitted to the American Petroleum Institute. **1977-2000:** EIA, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, DOE/EIA-0216(77-2000). **2001 and projections:** AEO2003 National Energy Modeling System, runs AEO2003.D110502C, LW2002.D110502C, and HW2002.

D110502C.EIA-0384(2001) (Washington, DC, August 2002). Lower 48 offshore, 1970-1985: U.S. Department of the Interior, *Federal Offshore Statistics: 1985*. Lower 48 offshore, 1986-2001: EIA, *Petroleum Supply Annual*, DOE/EIA-0340 (86-00). Lower 48 onshore, conventional, and enhanced oil recovery: EIA, Office of Integrated Analysis and Forecasting. **Projections:** Table A15.

Figure 92. Lower 48 crude oil production in three cases, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Table F11.

Figure 93. Alaskan crude oil production, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Table F11.

Figure 94. Petroleum supply, consumption, and imports, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Tables A11, B11, and C11. **Note:** Domestic supply includes domestic crude oil and natural gas plant liquids, other crude supply, other inputs, and refinery processing gain.

Figure 95. Share of U.S. petroleum consumption supplied by net imports in three cases, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Tables A11 and C11.

Figure 96. Domestic refining capacity, 1975-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Tables A11 and B11. Note: Beginning-of-year capacity data are used for previous year's end-of-year capacity.

Figure 97. Petroleum consumption by sector, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Table A11.

Figure 98. Consumption of petroleum products, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November2002). **Projections:** Table A11.

Figure 99. U.S. ethanol consumption, 1993-2025: History: History: Energy Information Administration, *Petroleum Supply Annual 2001*, Vol. 1, DOE/EIA-0340 (2001)/1 (Washington, DC, June 2002). **Projections:** Table A18.

Figure 100. Components of refined product costs, 2001 and 2025: Gasoline and diesel taxes: Federal Highway Administration, *Monthly Motor Fuel Reported by State* (Washington, DC, November 1998), web site www.fhwa.dot.gov/ohim/novmmfr.pdf. **Jet fuel taxes:** Energy Information Administration (EIA), Office of Oil and Gas. **2001:** Estimated from EIA, *Petroleum Marketing Monthly*, DOE/EIA-0380(2002/03) (Washington, DC, March 2002). **Projections:** Estimated from AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 101. Coal production by region, 1970-2025: History: Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** Table A16.

Figure 102. Average minemouth price of coal by region, 1990-2025: History: Energy Information Administration, *Coal Industry Annual 2000*, DOE/EIA-0584(2000) (Washington, DC, January 2002). **Projections:** AEO2003 National Energy Modeling System, run AEO2003. D110502C.

Figure 103. Coal mining labor productivity by region, 1990-2025: History: Energy Information Administration, *Coal Industry Annual 2000*, DOE/EIA-0584(2000) (Washington, DC, January 2002). **Projections:** AEO2003 National Energy Modeling System, run AEO2003 .D110502C.

Figure 104. Labor cost component of minemouth coal prices, 1970-2025: History: U.S. Department of Labor, Bureau of Labor Statistics (2001), series id: eeu10120006, and Energy Information Administration, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002). **Projections:** AEO2003 National Energy Modeling System, run AEO2003. D110502C.

Figure 105. Average minemouth coal prices in three mining cost cases, 1990-2025: Tables A16 and F13.

Figure 106. Projected change in coal transportation costs in three cases, 2001-2025: AEO2003 National Energy Modeling System, runs AEO2003.D110502C, LW2003. D110502C, and HW2003.D110502C.

Figure 107. Projected variation from reference case projections of coal demand for electricity generators in four cases, 2025: Tables A16, B16, and C17.

Figure 108. Electricity and other coal consumption, 1970-2025: History: Energy Information Administration (EIA), *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, DC, November 2002), and EIA, *Short-Term Energy Outlook October 2001*. **Projections:** Table A16.

Figure 109. Projected coal consumption in the industrial and buildings sectors, 2010 and 2025: Table A16.

Figure 110. Projected U.S. coal exports by destination, 2010 and 2025: History: U.S. Department of Commerce, Bureau of the Census, "Monthly Report EM 545." **Projections:** AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 111. Projected coal production by sulfur content, 2010 and 2025: AEO2003 National Energy Modeling System, run AEO2003.D110502C.

Figure 112. Projected carbon dioxide emissions by sector and fuel, 2005-2025: History: Energy Information Administration, *Emissions of Greenhouse Gases in the United States 2001*, DOE/EIA-0573(2001) (Washington, DC, December 2002). **Projections:** Table A19.

Figure 113. Carbon dioxide emissions per unit of gross domestic product, 1990-2025: History: Energy Information Administration, *Emissions of Greenhouse Gases in the United States 2001*, DOE/EIA-0573(2001) (Washington, DC, December 2002). **Projections:** Tables A19 and A20.

Figure 114. Projected carbon dioxide emissions from the electric power sector by fuel, 2005-2025: Energy Information Administration, *Emissions of Greenhouse Gases in the United States 2001*, DOE/EIA-0573(2001) (Washington, DC, December 2002). **Projections:** Table A19.

Figure 115. Carbon dioxide emissions in three economic growth cases, 1990-2025: History: Energy Information Administration, *Emissions of Greenhouse Gases in the United States 2001*, DOE/EIA-0573(2001) (Washington, DC, December 2002). **Projections:** Table B19.

Figure 116. Carbon dioxide emissions in three technology cases, 1990-2025: History: Energy Information Administration, *Emissions of Greenhouse Gases in the United States 2001*, DOE/EIA-0573(2001) (Washington, DC, December 2002). **Projections:** Table F4.

Figure 117. Projected methane emissions from energy use, 2005-2025: History: Energy Information Administration, *Emissions of Greenhouse Gases in the United States 2001*, DOE/EIA-0573(2001) (Washington, DC, December 2002). **Projections:** AEO2003 National Energy Modeling System, run AEO2003.D110502C110502C.

Figure 118. Projected sulfur dioxide emissions from electricity generation, 2005-2025: History: U.S. Environmental Protection Agency, *Acid Rain Program Emissions Scorecard 1999. SO_2, NO_x, Heat Input, and CO_2 Emissions Trends in the Electric Utility Industry*, EPA-430-R-98-020 (Washington, DC, June 2001). **Projections:** Table A8.

Figure 119. Projected nitrogen oxide emissions from electricity generation, 2005-2025: History: U.S. Environmental Protection Agency, *Acid Rain Program Emissions Scorecard 1999. SO_2, NO_x, Heat Input, and CO_2 Emissions Trends in the Electric Utility Industry*, EPA-430-R-98-020 (Washington, DC, June 2001). **Projections:** Table A8.